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is of too great a value for them to kill him. It is very rare that such a thing happens; it is under extraordinary circumstances if they resort to murder. Schlagintweit has two or three routes by which he may turn up yet. One is towards the Kirghis steppes and the Jaxartes, and if he comes upon the Russian pickets in that country he is certain to be safe. Another route is towards Persia, and I think he has a great chance of reaching that country and of passing through it.

SIR C. MURRAY.—The Persians are very hostile to the tribes that he is with.

MR. ATKINSON.—But not to him.

SIR C. MURRAY.—Not to him, but to the tribes.

MR. ATKINSON.—I can give you an instance of the possibility of his being yet alive. While I was absent I was lost for near eighteen months, and my friends in Siberia gave me up for dead. The gentleman with whom I had left what little property I had there, was about to make application to our minister in St. Petersburg, to know how it was to be disposed of. Fortunately, I returned and claimed it; and so, I think, Schlagintweit may turn up yet.

ADDITIONAL NOTICES.

Letter from Isaac J. Hayes, Esq., to the President, on the Arctic Expedition under the late Dr. E. K. Kane, &c.

To SIR RODERICK IMPEY MURCHISON, *President of the Royal Geographical Society of London.*

Philadelphia, May 23, 1858.

SIR,—I have learned that at a late meeting of the Royal Geographical Society a discussion arose upon the discoveries made by the American expedition to the Arctic Seas under the command of Dr. E. K. Kane of the U. S. navy.

By one of the London journals which reported the proceedings of the meeting, it appears that Dr. Rink of Copenhagen submitted some remarks touching the correctness of certain observations made by one of the exploring parties (William Morton, and Hans, an Esquimaux hunter) from the brig *Advance*, viz. the geographical position of the lands to the northward of the 80th parallel, and the open water reported to have been seen beyond it.*

The fidelity of Morton is vouched for by Dr. Kane to the extent of his means of knowledge as commander, in circumstances affording peculiar opportunities for ascertainment of character. His material was worked up by Mr. Charles A. Schott, an accomplished assistant of the U. S. Coast Survey Corps. Whatever error is assignable must therefore fall within one of these three descriptions, viz. imperfect instrumental observations, imperfect dead reckoning, and the mean adopted by Dr. Kane between the two.

I do full justice to the candour of Dr. Rink, and his desire to promote the accuracy of geographical records; but since he has announced his conclusions before the distinguished Society over which you presided, and his criticisms attracted the special attention of members so well instructed as yourself, Sir George Back, Captain Collinson, and Dr. Armstrong, it seems to be a duty incumbent upon myself at the earliest moment to invite the renewed

* For Dr. Rink's Paper see "Proceedings" R.G.S., vol. ii., p. 195, &c.; also "Journal" R.G.S., vol. xxviii.—Ed.

interest of your Society in some considerations to which due weight appears not to have been given in the published report of Dr. Rink's remarks and of the discussion to which they led.

The reader of Dr. Kane's narrative cannot fail to have perceived that he carefully guards against the supposition that he claims more for his materials than they deserved at the hands of geographers, and his map is expressly stated to be the result of a mean between Morton's solar observations and his dead reckoning. At the same time each kind of evidence is separately given, so as to enable every one to draw his own conclusions. The reasons which led Dr. Kane to adopt the method of mean position I do not propose here to discuss; but it appears to me obvious that if we reject them, and also the reckoning of Morton, there is nothing left upon which Dr. Rink can have any exception to the latitude assigned, unless he objects to the meridional observations as inaccurately made or reported. I happen to know that before Morton set out he was placed under the instruction of Mr. Sonntag, the astronomer to the expedition, who carefully trained him in the use of the sextant, and who afterwards expressed satisfaction with the skill attained by his pupil. I never heard the astronomer express the least doubt of the observations made by Morton on this special duty, nor were they ever questioned on ship-board to my knowledge. On the contrary, I have good reason to believe that Mr. Sonntag attributed entirely to the scrupulousness of Dr. Kane's caution in so important an affair, that the possibility of error in the use of the instrument was assumed by the latter gentleman in preparing his report for the press. Entertaining these views, I have thought proper, with the aid of Professor A. D. Bache and his assistant Mr. Schott, to consider what will be the effect upon the chart if we confine ourselves to the solar observations alone. At page 388 of vol. ii. of Dr. Kane's work, in Appendix vi., it will be seen that there are three important capes astronomically determined, viz. Capes Jackson, Madison, and Jefferson. At page 384, lat. 80° is given for Cape Madison, but as the same latitude is given for several other capes which are certainly not in the same parallel, it is obvious that a typographical error has escaped notice. At page 388, Cape Jackson is placed at $80^{\circ} 1' 5''$ (astronomically), Cape Madison at $80^{\circ} 20' 2''$, and Cape Jefferson at $80^{\circ} 41' 2''$. Beyond the last-mentioned Cape, Morton reports that he travelled northward according to his dead reckoning about 20 miles, which, as appears by the chart, Dr. Kane values as 12 minutes of nothing; making for Cape Independence a latitude of $80^{\circ} 53'$ and for Cape Constitution about $80^{\circ} 56'$.

Dr. Rink assigns to Cape Independence the latitude $80^{\circ} 41'$, the same as given to Cape Jefferson by the unmixed solar observations of Morton. Now, it will occur to you that, before Dr. Rink's position can be maintained, Morton's observations must be discredited, which they have not yet been, nor can they properly be before fresh ones shall have been made at the same points. His commander was always reluctant to assume the responsibility of final announcements to the scientific world unless the data had been collected within reach of his own use of the ordinary means of correction of error; and it was therefore natural for him to endeavour to make all of Morton's estimates of position concur as far as practicable to the determination of the truth. I ought to add, that several persons familiar with the making and calculating of solar observations have expressed the opinion that, if any inference can be drawn from the face of Morton's report, it will be that his results are in defect and not in excess of latitude. This may have been one of the many considerations which induced Dr. Kane to use all the material for a mean. It may prove that in this way a very slight additional nothing has been made; but this cannot be now assumed to be as great as it would appear by

Dr. Rink's method, and besides, as the elements and process are all fully stated in the printed report of the expedition, no one need be misled.

I say this much in justice to Dr. Kane, and I beg you to believe without any purpose or desire in an unfriendly manner to question the procedure of Dr. Rink, who I hope will see in this letter, if it should come to his notice, only a proof on my own part of the same disposition which he manifests to guard against erroneous apprehension of all the details of so important an expedition. I think he will agree with me, that it would be an excess of requisition to hold Dr. Kane in the strictest scientific sense responsible for an inaccuracy, if it should hereafter be found, upon fresh observations, that a few miles of error appear upon a chart which was constructed from materials obtained with great difficulty, in peculiar circumstances, and which he has published with full notice of all the known sources of possible error.

What is probably of more present importance is the question of the *open Polar Sea*. If we assume that the latitudes of the capes above-mentioned are as suggested by Dr. Rink, then the only consequence will be that the open sea, if it exists, will be so much nearer to us, and of course proportionately easier of access.

You are already familiar with the evidence which inspection of the explorations of Dr. Kane renders probable that during at least a part of the year the Polar Sea is free from ice. The approximate coincidence of the poles of magnetic and frigorific force, the tendency of all isothermal projections in the Arctic regions, the observations of Russian navigators, and of Sir Edward Parry and others, had made it probable, according to established rules of scientific deduction, that, after passing the belt of ice which encloses the circumjacentcies of the Pole, there would be found open water during at least a portion of the Arctic summer of every year. To these accumulative proofs, what was added by the report of Dr. Kane? Precisely the kind of evidence that was needed, viz. *positive testimony*. Morton avers that in the high latitude reached by him (and it is of little moment for the present question whether the latitude was $80^{\circ} 41'$, $80^{\circ} 56'$, or $81^{\circ} 12'$) he saw open water with very little ice, although a gale of wind had blown for two days from the north-east; also flocks of birds and two bears. We know that he went beyond any parallel determined by Dr. Kane. Cape Frazer, the highest point reached on the west side of the channel, was determined by my own observation at latitude $79^{\circ} 42' 9''$; and by none of the ship's company, except Morton and Hans, was any open water seen. Is there any reason to distrust the statement of these two persons? In the first place, their report corresponds with the previous proofs and probabilities above briefly cited, which were already in the possession of scientific men: secondly, Morton had always the confidence of his commander, as he has my own, in his veracity as a subordinate observer: thirdly, he brought with him to the ship bear-skins, in attestation of one part of his report,—and it is well known to Arctic navigators that the polar bear is usually found in the neighbourhood of open water: fourthly, the Esquimaux Hans was not capable of entering into any conspiracy to deceive; he was with difficulty understood, except through an interpreter; and upon his return to the brig I learned from him with such aid that he had seen much water, with pieces of ice and many birds. In such circumstances, to *deny* the report of Morton seems to require a scepticism scarcely warranted by the state of the evidence.

You will find various corroborative data in the narrative of his commander. If we assume the greatest intensity of cold is in the neighbourhood of the magnetic pole, then either that degree of cold continues to the Pole, or the increase of temperature is so slow that the freezing-point of sea-water is not passed before reaching the Pole, if the opinion attributed by the press to Dr.

Rink is well founded. But what data are there upon which to assert positively either of these alternatives, or upon which to contradict the positive testimony of the Russians, and of Morton and his companion? What is *known* of the Arctic regions which can warrant an *a priori* conclusion so sure as to justify the impeachment of witnesses otherwise without impeachment? To my own judgment the antecedent probabilities are so great, that if Morton's report were questioned at all, it would be upon the ground that he sought to adjust his account to scientific probability—a supposition which, to those who know the man, would be impossible.

To the enthusiastic reasoner upon Arctic explorations there are many temptations offered by the *literature* of my subject. I beg to refer you to the American Journal of Science, of May, 1858 (vol. xxv.), for an exemplification of the reserve with which I have permitted myself to consider antecedent reports: a copy of that article, which was hastily written at the friendly suggestion of Professor Dana, is herewith mailed to you. I beg your acceptance of it, as an humble, though, in its transmission, most hearty manifestation of personal respect. Through the kind offices of Professor Henry I was enabled to present my views at the Smithsonian Institution. An abstract of my lectures published in the National Intelligencer of Washington is also herewith mailed to you. At the last meeting of the American Association for the Advancement of Science I presented my reasons more at large. I enclose a newspaper report, which, though imperfectly made, will serve to exhibit the aspect in which I have adopted the evidence.

In the interests of science, and especially of the future development of the great Polar problem, which with the aid of my countrymen I hope ere long to solve, may I beg you to present to the Royal Geographical Society such of the foregoing remarks as you may deem pertinent to the discussion upon Dr. Rink's paper?

I have ventured to hope that your interest in the subject will extend so far as to procure your indulgence for this letter.

Believe me, with sincere respect,

Your obedient servant,

ISAAC J. HAYES,

*Late Surgeon to the American Arctic Expedition,
E. K. Kane, U.S.N., commanding.*
